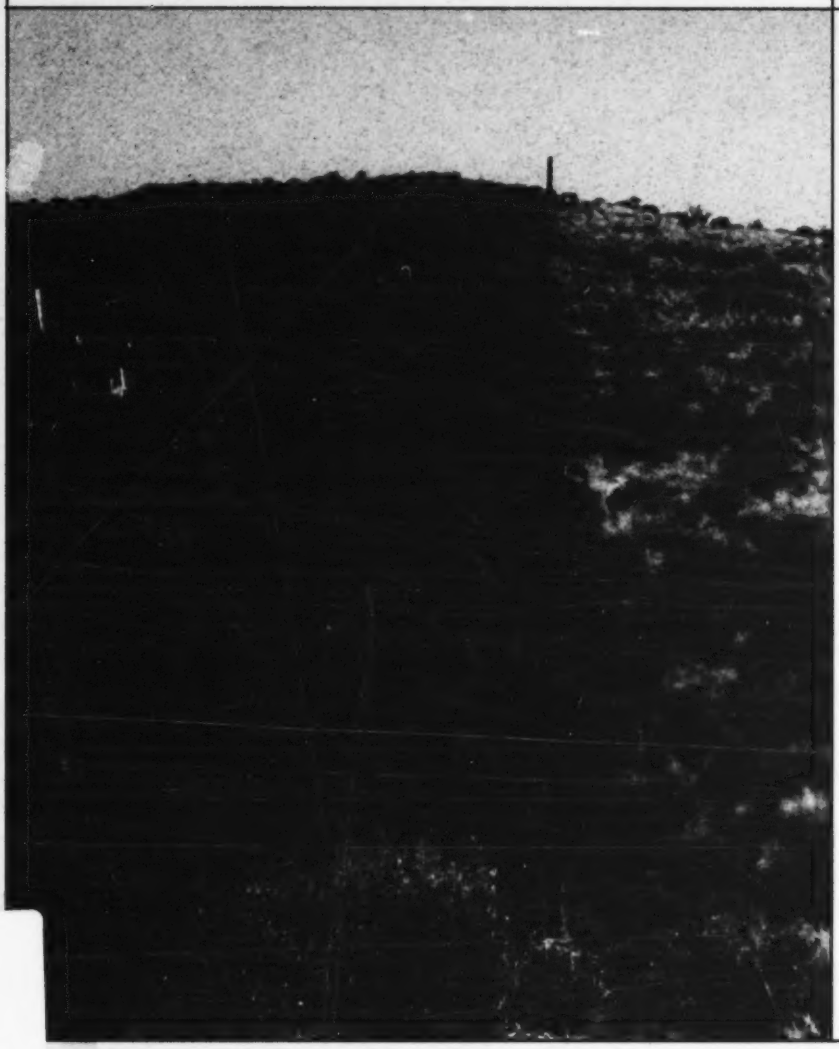
Range resources assessment procedures



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Citation:

Fraser, D.A. 2006. Range resources assessment procedures. B.C. Min. For. Range. Range Br., Kamloops, B.C. Rangeland Health Brochure 9.
URL: http://www.for.gov.bc.ca/hra

For more information on this subject, please contact:
Doug Fraser, Sr. Range Practices Agrologist
B.C. Ministry of Forests and Range, Range Branch
(250) 743-8933 local 225

For copies of this and other Range Branch materials, please contact:
B.C. Ministry of Forests and Range, Range Branch,
515 Columbia Street, Kamloops, B.C. V2C 2T7

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1 Introduction

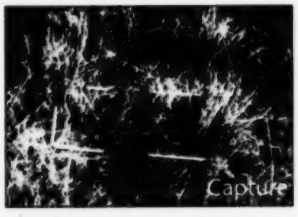
This document gives instructions on how to assess the health of upland and riparian areas.

The overall objectives for range management are:

- to maintain healthy functioning riparian and upland systems
- to restore and maintain desired plant communities through proper management
- to ensure that there will be no net loss of native species
- to allow safe levels of use

The range use plan identifies how range will be managed to achieve goals related to production, biodiversity, and integrated resource management. The initial range use plan and management prescription is developed from an interpretation of baseline information and records of historic use. Follow-up monitoring is required to evaluate the effectiveness of the management prescription and tenure holder compliance.

2 Definitions and Principles



2.1 What is a watershed?

A watershed is land on which water falls from the atmosphere, is stored within the soil, and over a period of time is released downslope to other locations. Each watershed is a catchment area divided from the next watershed by topographic features.

A watershed's primary functions are to capture, store, and safely release water.

Capture is the process of water getting from the atmosphere into the soil. As a general principle, precipitation should infiltrate the soil where it falls.

Storage. Water that has infiltrated the soil is stored between particles in the soil profile. The storage capacity of the soil depends on soil texture, depth, and structure. Water in excess of field capacity will either percolate deeply, or run off the soil surface.

Safe release. Water moves through the soil profile to seeps, springs,

and finally to streams and rivers. The amount and rate of water released depends on two factors:

- the water already in the soils of the uplands, riparian areas, and streambanks in excess of field capacity
- precipitation that exceeds the infiltration rate and flows over the soil surface

Shows presence of water with distinct vegetation.

2.2 Riparian areas

The **riparian area** is defined in the Forest Practices Code Operational Planning Regulation as an area of land that: "(a) is adjacent to a stream, river, lake or wetland, and (b) contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas." Riparian areas vary in width and may extend beyond the bounds of the **Riparian Management Area** defined for timber harvesting and silvicultural activities. Livestock grazing is allowed within riparian areas.

2.3 Desired plant community (DPC)

The DPC is defined as a plant community that produces the kind, proportion, and amount of vegetation necessary for meeting range use plan and higher-level plan objectives. The DPC must be consistent with the site's capability.

2.4 Stream channel characteristics

- steep-gradient streams generally need deep-rooted trees and shrubs for stabilization
- low-gradient streams can be stabilized by strongly rooted grasses, sedges, and rushes
- some stream channels are controlled by coarse woody debris (look for the presence of woody debris with deposition of sediments)
- some stream channels are controlled by large cobbles and boulders; these do not need vegetation for bank stabilization
- some streams are naturally unstable because of gradient and confinement

3 Assessment Procedures

(See also Procedures for Environmental Monitoring in Range and Wildlife Habitat Management Guidelines [HMGs], Chapters 2.3 and 3.)

3.1 Pre-assessments

- gather historic records (photos, maps, monitoring records, field inspection reports, grazing schedules, current range use plans)
- using maps or aerial photos, pre-stratify the range agreement area by areas of primary use, secondary use, and non-use
- identify areas requiring special treatment or demanding special attention (riparian areas, wildlife habitat areas, recreation areas, recently planted cutblocks, community watersheds, etc.)
- identify (mark) range developments on the maps
- develop/review desired plant community descriptions for the major vegetation types within the tenure area
- inquire of appropriate agencies re: special needs, new concerns, etc.

3.2 Field assessments

- the level of detail will be dictated by the actual livestock use
- do not spend a lot of time on areas that livestock use lightly
- focus on areas of primary use (of particular interest will be areas of early spring use, riverine riparian zones, and individual significant wetlands and wetland complexes)
- carry out a reconnaissance of the area:
  - verify locations of developments (update)
  - verify patterns of use by livestock
  - use the appropriate checklists to determine if uplands and wetlands are functioning properly and whether desired plant community goals are being achieved
  - note any changes in conditions of range and riparian areas (do visual estimates of plant species cover; compare to benchmarks)
- get a general overview of how well current management is working
- make field notes and compare to inspection reports from previous years

Uplands Function Checklist

Parameters
Hydrologic and Soils

A function checklist for upland areas.

- establish some fixed photo-points where needed
- compare observations over time
- if a reconnaissance indicates some problems, establish some permanent transects or sampling points using the HMGs or other approved methods
- review the data
- compare to range reference areas if they exist

Figure 1 is an example of how a range agreement area might be zoned during an inspection.

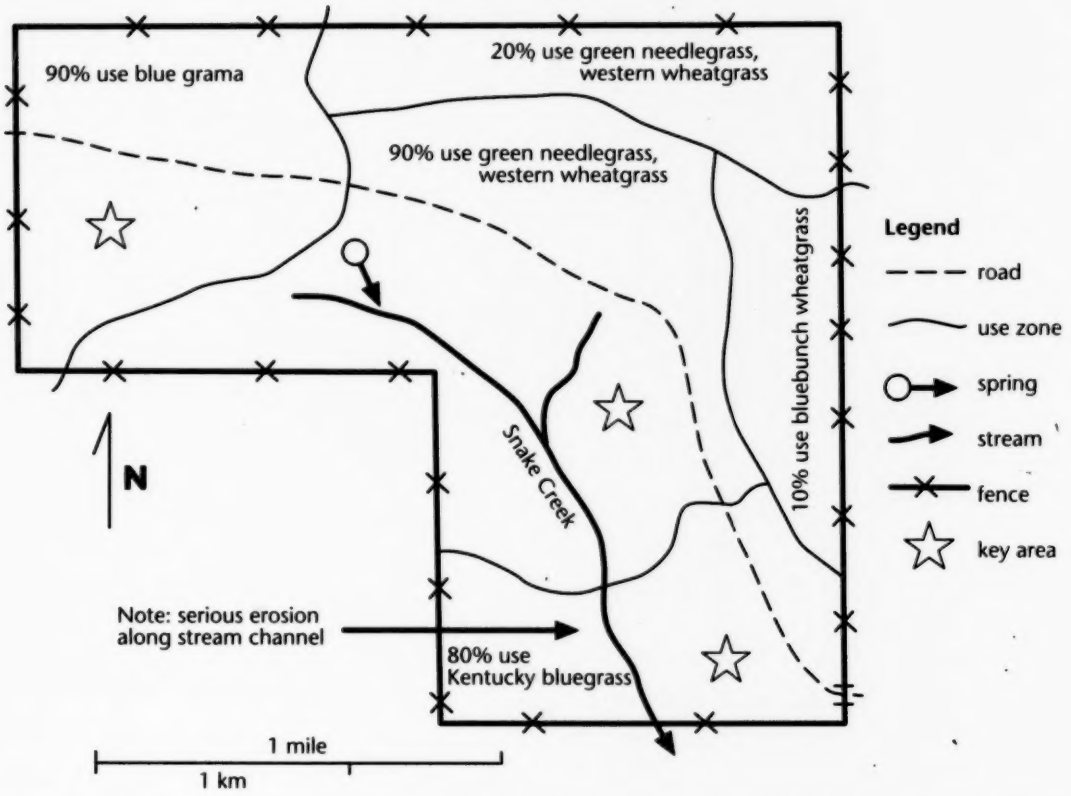
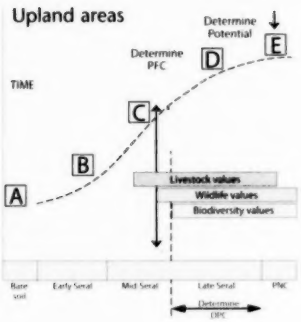


Figure 1 A sketch map of a pasture illustrating a typical pattern of use as represented by zones and data recorded during a reconnaissance.

4 Determining Site Potential

Knowledge of site potential is essential to the setting of realistic management goals and the development of appropriate management prescriptions.

- consider the regional climate and site micro-climate
- consider the disturbance regime of the site
- look for comparable relic areas (exclosures, reserves)
- search the files for notes and historic photos. These records are not necessarily something to strive for, but may give insight into the current condition of the site. Photos may show evidence of forest encroachment or ingrowth, changes in wetlands and streams, and the results of changes in management.
- examine the profile and texture of the soils
- examine stream floodplains and channels and observe changes that have occurred; note whether or not a stream seems to have experienced frequent or infrequent catastrophic flooding events
- look for evidence of large organic debris collecting sediment
- determine potential natural community (PNC) based on above information



Determining DPC in upland and riparian areas.

A **desired plant community (DPC)** must be described in the range use plan for each major riparian and upland vegetation type and ideally should include:

- the seral stage (early-seral, mid-seral, late-seral, and PNC-climax)
- the mix of species and species' age-classes (including regenerating plants)
- the horizontal and vertical distribution of foliage (structural characteristics determined by the development of vegetation layers and plant growth forms)
- connectivity
- the amount and distribution of residual cover, basal cover, surface litter, and coarse woody debris

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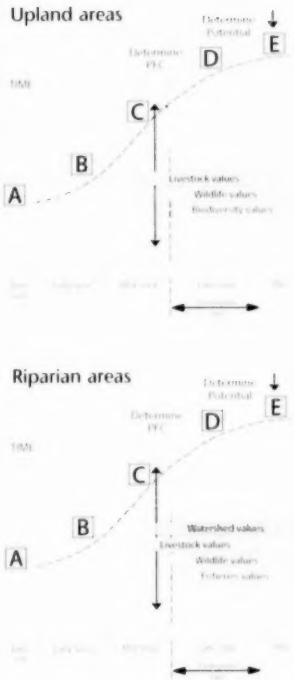

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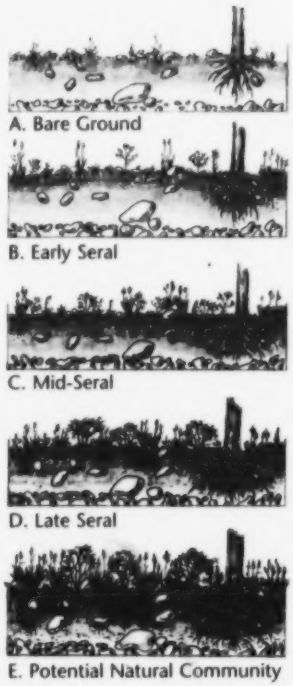
- connectivity
- the amount and distribution of residual cover, basal cover, surface litter, and coarse woody debris

The **PNC** is defined as the community that would become established on an ecological site if all successional sequences were completed without interference by humans under present environmental conditions. Natural disturbances are inherent in its development. The PNC may include naturalized non-native species.

5 Questions Concerning a Riparian or Upland Assessment

- is the range use plan being followed?
- have recent events (drought, fire, grasshoppers, logging, flooding, etc.) influenced the watershed?
- which areas have the greatest potential for positive vegetation response (increased productivity and species diversity)?
- in which areas will vegetation succession occur quickly?
- what pathways will succession take? (seral stages, PNC)
- on degraded sites, how long will recovery take in the absence of livestock use? how long will it take with improved livestock management?
- which areas have the greatest potential for increased AUMs?
- which riparian zones have the greatest capacity for storing subsurface water and regulating stream flow? (this relates to soil texture, soil depth, and field capacity)
- which streams or wetlands have the greatest potential for filtering and storing sediment and improving water quality? (this relates to soil texture and depth)
- how can the preferred timing and intensity of livestock use be determined?
- what constitutes overgrazing[1] on any given area?



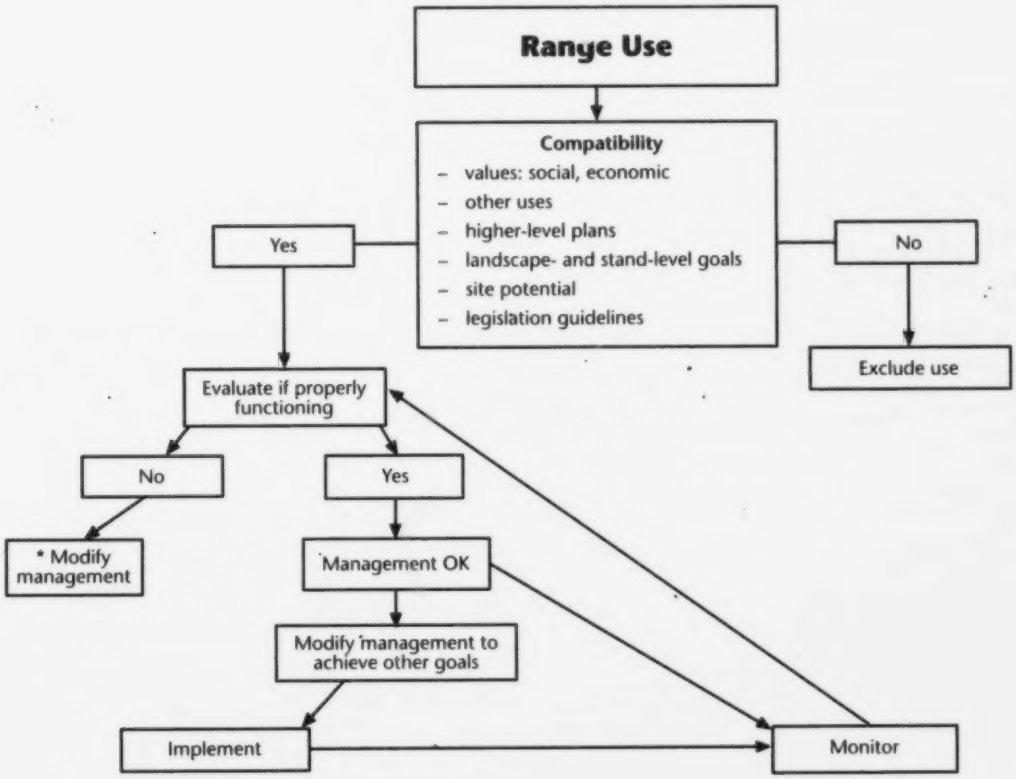
Succession on uplands.

1 Overgrazing is defined as defoliation that is so severe and/or frequent that the grazed plant is unable to fully recover before being defoliated again. This leads to reduced vigour and competitiveness and eventually to death and replacement of the plant by other, more adapted species. Overgrazing may apply to individual plants and/or to the plant community as a whole.

Water is an effective attractant.

- to what degree do geologic and hydrologic events operate independently of grazing? (natural down-cutting of stream channel, landslides, flooding)
- what positive effects might we expect from initiating new grazing systems, changing season of livestock use, and modifying livestock or wild ungulate behaviour?

Figure 2 indicates the relationship between monitoring and management of livestock use in range and riparian areas.

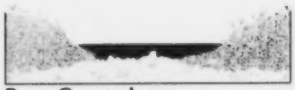


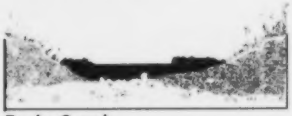
* Tools
  - Time (season, duration, frequency)
  - Rest
  - Intensity (level of use)
  - Distribution (fence, salt, ride, water development, electronic stimuli)
  - Other disturbances (fire, mowing, clearing, spraying, scarifying, planting, seeding)
  - Bank stabilization
  - Stock rate

Figure 2 Evaluating livestock use of riparian and upland areas.

6 The Concept of Proper Functioning Condition

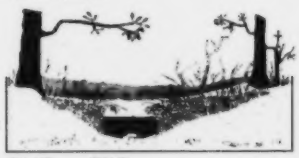
Upland and riparian-wetland areas influence aquatic resources; therefore, grazing management must be integrated with the management of the entire watershed. The achievement of proper functioning condition and desired plant communities in riparian-wetland areas and uplands contributes the physical and biological characteristics necessary to restore and maintain aquatic habitats.


Bare Ground


Early Seral

Mid-Seral

Late Seral


PNC or PPC

6.1 Riparian and aquatic areas

Riparian and aquatic areas are functioning properly when there is adequate structure (vegetation, landform, or large woody debris) present to provide the following benefits applicable to a particular area:

- dissipation of stream energy associated with high waterflows (reducing the potential for erosion and leading to improved water quality)
- filtering of sediment, capture of bedload, and aid in floodplain development
- maintenance of natural floodwater retention and groundwater recharge
- root masses that stabilize streambanks against cutting action
- ponding and channel characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses
- maintenance of habitats for native plants and animals

6.2 Upland areas

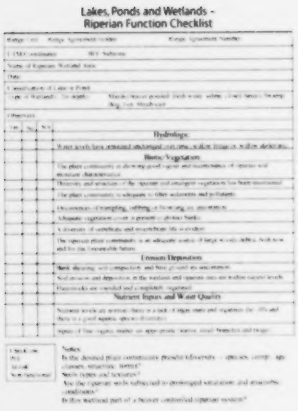
Uplands are the largest component of the watershed. Most precipitation enters the watershed via uplands, so the condition and treatment of uplands directly affect the health and functioning of the rangeland ecosystem. Upland areas are functioning properly when vegetation, soil surface, erosional processes, and biological cycling are in proper balance. The following should be evident:

- water is not restricted from infiltrating the soil surface

- organic matter protects the soil surface from raindrop impact and the evaporative effects of sun and wind
- standing vegetation captures drifting snow, detains overland water flow, and traps sediment
- the plant community has reached the **DPC**, or is showing an upward trend
- ephemeral drainages are stable (no active downcutting and bank-cutting)
- biological breakdown of plant residues is apparent (as evidenced by plant decomposition from the base, nutrient cycling, and lush green growth, as opposed to oxidization of plant materials [as is common in unhealthy range ecosystems])

6.3 Assessing for proper functioning condition

A number of forms and checklists are found in the appendices. These should be reviewed in advance of fieldwork, and any necessary file or historic information should be gathered and recorded at that time. Generally, you should get a feel of the area by walking a stream reach or traversing an upland area before filling in the checklists or forms; this will help to gain a broader perspective that otherwise may be lost if you become too concerned with making notes. Look for relic areas or areas where livestock use has been light in order to determine site potential.


Lakes, Ponds and Wetlands - Riparian Function Checklist

A function checklist for wetlands and riparian areas.

The **function checklists** may be used to quickly assess for proper functioning condition at a reconnaissance level. To qualify as functioning properly, riparian (including the feature) and upland areas must satisfy the above general conditions, and the answers to the majority of statements in the checklists must be "Yes."

The **forms for extensive monitoring of stream channels, wetlands, and associated riparian areas** are designed for a slightly more detailed level of monitoring, but allow for estimations rather than detailed measurements.

Guidelines for detailed monitoring of riparian and upland Range Reference Areas are being developed.

7 Range Management Practices

Riparian and upland systems not functioning properly will require remedial measures. Several tools are available to ensure that cattle are properly managed within and adjacent to riparian areas. Tool selection depends on site suitability, management goals, and overriding regulations. Management options will be discussed through the normal referral process. Improvements must be detectable both visually and quantitatively.

The **key principle** in riparian and upland management is **management of disturbances**:

existing plant community + disturbance + time = desired plant community

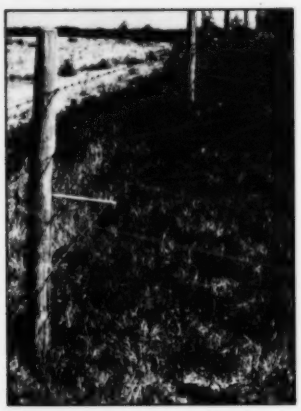
The following is a list of tools available to the manager.

7.1 Time

- season of use
- duration or length of grazing period
- frequency (how often grazing is repeated)

7.2 Intensity of use

- level of utilization of key plant species (stubble heights)



Barbed-wire fence with electric offset.

7.3 Distribution of use

- fencing
- access trails
- barrier placement to prevent trailing, trampling, and congregating
- salting
- riding or herding
- water development outside the riparian zone
- electronic stimuli
- manipulation of upland vegetation to make it more attractive to livestock

7.4 Rest

- allow adequate time for plants to recover from grazing events
- allow plants to complete specified phenological stages
- allow soils to dry to the point where hoof damage will not occur
- allow bare soils to revegetate
- allow banks to restabilize

7.5 Applied disturbances (subject to regulations and referrals)

- prescribed fire
- mowing
- herbicide spraying
- seeding of herbaceous species
- planting trees and shrubs
- canopy modification through clearing, selective harvesting, thinning, and pruning
- scarification/aeration

7.6 Bank stabilization (subject to regulations and referrals)

- mechanical and structural
- rest from use
- plantings and seeding
- use of natural, narrow rocky areas for livestock watering to reduce trampling damage and loitering; if none exists, create one

Rip rap to prevent bank erosion.

7.7 Channel modification (subject to regulations and referrals)

- restoring normal channel functions and patterns
- removal of channel obstructions
- placement of channel obstructions

Appendix 1 Function checklists

How to use the function checklists

The checklists should be reviewed in advance of fieldwork, and any necessary file or historic information should be gathered and recorded at that time. Generally, you should get a feel of the area by walking a stream reach or traversing an upland area before filling in the checklists or forms; this will help to gain a broader perspective that otherwise may be lost if you become too concerned with making notes. Look for relic areas or areas where livestock use has been light in order to determine site potential.

Use the field checklists in assessing proper functioning condition (PFC) at the reconnaissance level. To qualify as functioning properly, riparian (including the feature) and upland areas must satisfy the general conditions outlined in Section 6 of this guide, and the answers to most of statements in the checklists must be "Yes."

An area is "at risk" when functioning at some level, but when a combination of attributes makes it vulnerable. A score of "at risk" may trigger some follow-up action (e.g., more detailed monitoring or a change in management) or, if an upward trend emerges, may verify that the management prescription is working.

An area is "non-functional" when the criteria in Section 6 are not met and degradation is occurring.

The following table can be used to score the area being assessed. Pay particular attention to categories that give borderline answers, because these indicate trend and may serve as either early warnings or indicators of recovery in damaged systems.

% of "Yes" answers	Rating
80%	PFC
61–79%	Slightly at risk
41–60%	Moderately at risk
20–40%	Highly at risk
20%	Non-functional

Lakes, Ponds, and Wetlands Riparian Function Checklist

Range Unit:			Range Agreement Holder:
			Range Agreement Number:
UTM Coordinates:			BEC Subzone:
Name of Riparian-Wetland Area:			
Date:			Segment ID:
Classification of Lake or Pond:			
Type of Wetland (<2 m depth): Marsh ☐ (beaver-ponded; fresh water; saline; closed basin) Swamp ☐ Bog ☐ Fen ☐ Shrub-carr ☐			
Observers:			
Yes	**No**	**N/A**	**Parameters**
			Hydrologic
			Water levels have remained unchanged over time (willow fringe or willow skeletons)
			Biotic/Vegetation
			The plant community is showing good vigour and maintenance of riparian soil moisture characteristics
			Diversity and structure of the riparian and emergent vegetation has been maintained
			The plant community is adequate to filter sediments and pollutants
			Occurrences of trampling, rubbing, or browsing are uncommon
			Adequate vegetation cover is present to protect banks
			A diversity of vertebrate and invertebrate life is evident
			The riparian plant community is an adequate source of large woody debris, both now and for the foreseeable future
			Erosion/Deposition
			Bank shearing, soil compaction, and bare ground are uncommon
			Soil erosion and deposition in the wetland and riparian area are within natural levels
			Hummocks are rounded and completely vegetated
			Nutrient Inputs and Water Quality
			Nutrient levels are normal (there is a lack of algal mats and organism die-offs and there is a good aquatic species diversity)
			Inputs of fine organic matter are appropriate (leaves, small branches, and twigs)

Check one

- ☐ PFC
- ☐ At risk
- ☐ Non-functional

Notes:

Is the desired plant community present (diversity—species, composition, age classes, structure, form)?

Soil types and textures?

Are the riparian soils subjected to prolonged saturation and anaerobic conditions?

Is this wetland part of a beaver-controlled riparian system?

To complete the Function Checklists, observe and consider the following in addition to the indicators listed on the checklists.

Lakes, Ponds, and Wetlands—Riparian Function Checklist

Hydrologic

1. Water levels have remained unchanged over time.

   Note: What is the source of water for this wetland? Is it overland flow, groundwater, or channel flow? Is this a beaver-influenced wetland? Has the hydrology been influenced by land management practices in the watershed? Willows indicate the average high water-mark for many wetland types.

Biotic/Vegetation

1. The plant community is showing good vigour and maintenance of riparian soil moisture characteristics.

   Note: Check for vigour and recruitment of phreatophytes.

2. Diversity and structure of the riparian and emergent vegetation has been maintained.

   Note: Widths of riparian and emergent vegetation bands will fluctuate annually. Monitor for long-term changes.

3. The plant community is adequate to filter sediments and pollutants.

   Note: Healthy bands of riparian and emergent vegetation are effective in reducing turbidity and capturing pollutants.

4. Occurrences of trampling, rubbing, or browsing are uncommon.

   Note: Is the vigour of the vegetation being reduced by these? Is trampling occurring around the entire perimeter, or is it limited to a few watering locations?

5. Adequate vegetation is present to protect banks.

   Note: There should be adequate vegetation to protect the banks from the actions of winds and waves.

6. A diversity of vertebrate and invertebrate life is evident.

   Note: Low species diversity may be an indication of a problem. Consider both the wetland and the riparian zone.

7. The riparian plant community is an adequate source of large woody debris, both now and for the foreseeable future.

   Note: Woody species are present and able to contribute to the stream system. There are new recruits to replace those that have fallen.

Erosion/Deposition

1. Bank shearing, soil compaction, and bare ground are uncommon.

   Note: If evident, is it to a watering site, or does it occur around the entire wetland?

2. Soil erosion and deposition in the wetland and riparian area are within natural levels.

   Note: Soil erosion and deposition outside natural levels may indicate a problem with the surrounding uplands.

3. Hummocks are rounded and completely vegetated.

   Note: Hummocks can be created by livestock trampling. However, some species of sedge create their own hummocks to avoid prolonged saturation. Hummocks should be rounded and completely vegetated.

Nutrient Inputs and Water Quality

1. Nutrient levels are normal.

   Note: Is there excessive livestock dung? Are there thick algal mats? Is there evidence of organism die-offs? Does the invertebrate population indicate a worsening in habitat or water quality (species shifts, lower diversity)?

2. Inputs of fine organic matter are appropriate.

   Note: Does detritus form an integral part of the food chain?

Streams Riparian Function Checklist

Range Unit:			Range Agreement Holder:
			Range Agreement Number:
UTM Coordinates:			BEC Subzone:
Name of Stream:			
Date:		Segment/Reach ID:	Gradient of Segment: Low ☐ Medium ☐ High ☐
Stream Type:			Perennial ☐ Intermittent or Ephemeral ☐ Continuous or Interrupted ☐
Observers:			
Yes	**No**	**N/A**	**Parameters**
			Channel Structure, Function, and Diversity
			Channel characteristics (rocks, large woody debris) and associated floodplain (access to overflow areas) are adequate to dissipate energy
			Channel and banks are relatively stable
			Lateral movement is associated with natural sinuosity
			The segment is vertically stable
			Erosion, deposition, and movement of bed materials are normal for this reach
			Bank shearing, soil compaction, and bare ground are uncommon
			Sinuosity, width/depth ratio, gradient, pool/riffle ratio, and other aspects of channel geometry are in balance with the landscape setting (e.g., landform, geology)
			Inputs of organic debris from adjacent riparian area and subsequent incorporation into the channel are normal for area
			Banks are undercut
			Riffle-bed materials and gravels are free of sediment. Fish spawning and use of rock undersides by insects and other invertebrates are possible
			Flow Regime
			Flow rates and timing remain unchanged over time (i.e., perennial to intermittent or ephemeral; continuous to interrupted)
			Biotic Community
			Roots of trees, shrubs, and grasses extend into the stream. Root masses are capable of withstanding high streamflow events and allowing formation of overhanging banks
			The plant community exhibits high vigour and indicates maintenance of riparian soil moisture characteristics
			Occurrences of trampling, rubbing, or browsing are uncommon
			Riparian plant communities are an adequate source of replacement woody debris, both now and in the foreseeable future
			A diversity of vertebrate and invertebrate life is evident
			Nutrient Inputs and Water Quality
			Nutrient levels are normal (there is a lack of algal mats and organism die-offs, and there is a good aquatic organism diversity)
			Inputs of fine organic matter are appropriate (leaves, small branches, and twigs)

Check one

- ☐ PFC
- ☐ At risk
- ☐ Non-functional

Notes:

Is the desired plant community present (diversity—species, composition, age classes, structure, form)?
Does the substrate make this stream susceptible to either vertical or lateral erosion?
Soil types and textures?
Are the riparian soils subjected to prolonged saturation and anaerobic conditions?
Is the stream beaver-controlled?
Is the stream effluent or influent?
Have land uses altered the dynamics of the system?

To complete the Function Checklists, observe and consider the following in addition to the indicators listed on the checklists.

Streams Riparian Function Checklist

Channel Structure, Function, and Diversity

1. Channel characteristics and associated floodplain are adequate to dissipate energy.

   Note: Is stream energy naturally dissipated through the presence of rocks/boulders, large woody debris, shrubs/sedges, or natural sinuosity? Does the stream have easy access to its floodplain during high flow?

2. Channel and banks are relatively stable.

   Note: Channels and banks are not static; it is natural for channels to move and evolve over time. Do not confuse natural channel movement with accelerated change. Bank undercutting should be balanced by bank building on the opposite side.

3. Lateral movement is associated with natural sinuosity.

   Note: Do not confuse natural sinuosity with accelerated lateral movement across the floodplain. Lateral erosion leads to an increase in channel width.

4. Erosion, deposition, and movement of bed materials are normal for this reach.

   Note: Is meander erosion balanced by point bar deposition? Are point bars revegetating? Is there evidence of excessive movement of bed materials, as indicated by extensive riffles?

5. Bank shearing, soil compaction, and bare ground are uncommon.

   Note: Some bank collapse will be related to natural undercutting, but, on the whole, bank collapse, compaction/trampling, and bare ground should be minimal. Is trampling to a point water source or along the entire reach?

6. Sinuosity, width/depth ratio, gradient, pool/riffle ratio, and other aspects of channel geometry are in balance with the landscape setting.

Note: Sinuosity should be balanced with the slope and landscape position of the stream. Is the channel deep relative to its width? Pools should represent 2/3 of the length of any reach; riffles should represent 1/3 the length of any reach. The sequence of pools and riffles should repeat itself every five to seven bankfull widths. Pools should be fine-textured and deep, and riffles should be coarse-textured and shallow. Excessive riffle length is evidence of excessive movement of bed materials. Channel bars should be at the margins, not in mid-channel.

7. Inputs of organic debris from the adjacent riparian area and subsequent incorporation into the channel are normal for the area.

   Note: Are trees and shrubs being incorporated by natural mortality and windfall at a normal rate?

8. Banks are undercut.

   Note: Are undercut banks appropriate for the stream segment? Consider the gradient, bank texture, and bed materials.

9. Riffle-bed materials and gravels are free of sediment. Fish spawning and use of rock undersides by insects and other invertebrates are possible.

   Note: Look at rock undersides for evidence of invertebrate life. Water temperature, purity, and turbidity will influence the invertebrate species found there.

Flow Regime

1. Flow rates and timing remain unchanged over time.

   Note: Any water control structures will influence flow rates, timing, and sediment loads (and the ability to rebuild banks). Has the stream changed from permanent to intermittent or ephemeral, or from continuous to interrupted?

Biotic Community

1. Roots of trees, shrubs, and grasses extend into the stream. Root masses are capable of withstanding high-streamflow events and allowing formation of overhanging banks.

Note: Are there overhanging banks? Are there deep-rooted sedges as opposed to shallow-rooted grasses on the streambank? Do the root masses of shrubs or trees extend into the channel, influencing its depth and direction of flow? Check the soil texture. Willows require coarse-textured substrates and will not grow in oxygen-poor soils. Sedges will grow in anaerobic conditions.

2. The plant community exhibits high vigour and indicates maintenance of riparian soil moisture characteristics.

   Note: Are the species present vigorous riparian species, or have upland species encroached?

3. Occurrences of trampling, rubbing, or browsing are uncommon.

   Note: Excessive trampling leads to soil compaction and poor water infiltration. Trampling, rubbing, and browsing will reduce the vigour of the plant community.

4. Riparian plant communities are an adequate source of replacement woody debris, both now and in the foreseeable future.

   Note: Woody species are present and able to contribute to the stream system. There are new recruits to replace those that have fallen.

5. A diversity of vertebrate and invertebrate life is evident.

   Note: This diversity occurs in both the stream itself and in the riparian zone.

Nutrient Inputs and Water Quality

1. Nutrient levels are normal.

   Note: Is there excessive livestock dung? Are there thick algal mats? Is there evidence of organism die-offs? Does the invertebrate population indicate a worsening in habitat or water quality (species shifts, lower diversity)?

2. Inputs of fine organic matter are appropriate.

   Note: Does detritus form an integral part of the food chain?

Uplands Function Checklist

Range Unit:			Range Agreement Holder:
			Range Agreement Number:
UTM Coordinates:			BEC Subzone:
Name of Upland Area:			
Date:			Location:
Hectares:			
Observers:			
Yes	**No**	**N/A**	**Parameters**
			Hydrologic and Soils
			Organic material (plant litter, standing vegetation) protects soil surface from raindrop impact and evaporative effects of sun and wind
			Water will easily infiltrate the soil surface (absence of physical soil crusting, capping)
			Subsurface soil conditions support infiltration (compaction layers are uncommon)
			Standing vegetation and plant litter detain overland water flow and trap sediment
			Non-stream ephemeral drainages are stable (sufficient vegetation is present to protect against downcutting)
			Biotic/Vegetation
			The plant community is showing good vigour
			There is recruitment of desirable plant species (new seedlings)
			The plant community reflects a fully occupied root zone
			Seeps, springs, and ephemeral drainages support vigorous stands of phreatophytic plants
			Biological breakdown of plant residues / organic material is apparent (decomposition as opposed to oxidization)
			Biological breakdown of livestock dung is rapid
			A diversity of vertebrate and invertebrate life is evident
			Erosion/Deposition
			Evidence of rills, gullies, pedestalling, and other excessive soil movement is uncommon
			There is little visual evidence of pedestalling of plants or rocks. Pedestals present are sloping or rounding and accumulating litter

Check one

- ☐ PFC
- ☐ At risk
- ☐ Non-functional

Notes:

Is the desired plant community present (diversity—species, composition, age classes, structure, form)?

Soil types and textures?

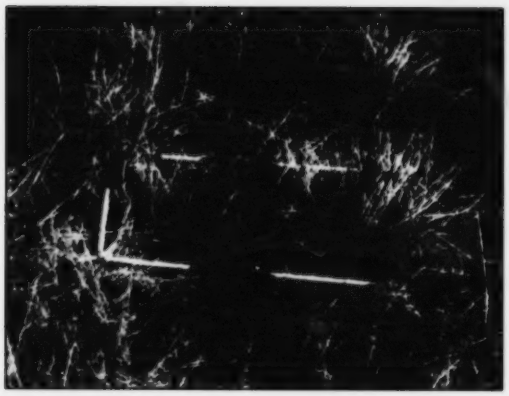
To complete the Function Checklists, observe and consider the following in addition to the indicators listed on the checklists.

Uplands Function Checklist

Hydrologic and Soils

1. Organic matter protects soil surfaces from raindrop impact and evaporative effects of sun and wind.

   Note: Most of the ground surface should be protected by live vegetation or dead plant material.



2. Water will easily infiltrate the soil surface.

   Note: Soil surface conditions should allow for precipitation to penetrate. Soil crusting or capping should not occur.

3. Subsurface soil conditions support infiltration.

   Note: Check for soil compaction or impenetrable layers.

4. Standing vegetation and plant litter detain overland flow and trap sediment.

   Note: There is no sign of rilling.

5. Non-stream ephemeral drainages are stable.

   Note: These drainages are well vegetated and show no sign of rills.

Biotic/Vegetation

1. The plant community is showing good vigour.

   Note: Proper growth form and stature. Good seed production.

2. There is recruitment of desirable plant species. Deep-rooted perennial plants should dominate the plant community.

   Note: This refers to native decreaser species.

3. The plant community reflects a fully occupied root zone.

   Note: Dig a soil pit. Roots should penetrate deeply into the soil profile.

4. Seeps, springs, and ephemeral drainages support vigorous stands of phreatophytic plants.

   Note: These are plants that place their roots in the water table.

5. Biological breakdown of plant residues / organic material is apparent.

   Note: Dead plant material should decompose rather than oxidize on the stem. For for this to happen, it needs to make contact with the soil surface.

6. Biological breakdown of livestock dung is rapid.

   Note: Is dung breaking down rapidly, or does it remain intact for years?

7. A diversity of vertebrate and invertebrate life is evident.

   Note: Consider soil organisms, insects, and vertebrates

Erosion/Deposition

1. Evidence of rills, gullies, and other excessive soil movement is uncommon.

   Note: Vegetation should prevent formation of these. Old rills and gullies should be revegetated.

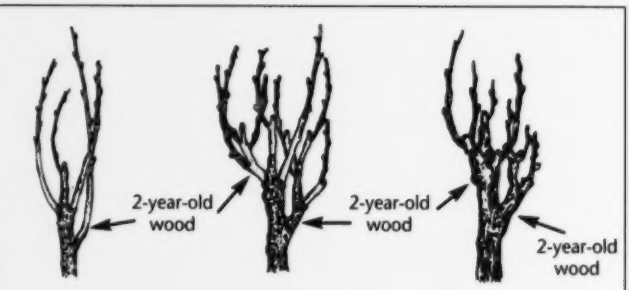
2. There is little evidence of pedestalling of plants or rocks. Pedestals present are sloping or rounding and accumulating litter.

   Note: This is evidence of recovery.

Description of Plant Communities and Habitats

Browse Utilization

List of Preferred Browse Species On Site	Browse Use Categories—Current Year's Growth		
	Light 0–10%	Moderate 11–40%	Heavy >40%



Current Plant Community

Desired Plant Community

Stubble Height

____ m transect. Measurements taken every ____ paces.

Pattern of Use:

Measurements:

Max. height ____ Min. height ____ Avg. height ____

Max. height ____ Min. height ____ Avg. height ____

Max. height ____ Min. height ____ Avg. height ____

Max. height ____ Min. height ____ Avg. height ____

Max. height ____ Min. height ____ Avg. height ____

Robel Pole Measurements

___ m transect.

Measurements taken every ___ paces.

Max: ___ Min: ___ Average: ___

Photo Numbers: _____

Invasive Plants

Species: _____

Size of Infestation: <100 m² ☐
100–2500 m² ☐
>1 ha ☐

Distribution: Rare individuals ☐
Scattered patches ☐
Continuous stands ☐

Notes – (Plant community, structure, recruitment, litter, bare ground, invasive species)

How to fill out "Description of Plant Communities and Habitats"

1. Browse utilization and form class

At each site, record the major shrub species, estimate the current browse use, and describe the form class (an indication of past use).

2. Current and desired plant community descriptions

At each site, describe the current and desired plant community by layers, and by dominant and co-dominant species, and estimate the current seral stage. Seral stage is defined as the plant community's similarity to the potential natural community (PNC)-climax, which is considered to be the site's potential. Seral stage categories have the following ranges:

	Early-seral	Mid-seral	Late-seral	PNC-climax
% similarity to PNC-climax	0–25%	25–50%	50–75%	>75% climax

3. Stubble height measurements

Surveyors establish a line transect and use a "point" sampling procedure. The surveyor walks a transect and, at an interval of five paces, records the indicator grass or sedge species that lies closest to the toe of the right boot. Depending on the uniformity of stubble height, from 20 to 80 measurements are taken along each transect. Leaf length is recorded for each plant sampled.

Stubble height is reported as a minimum, a maximum, and an average. This assumes that, under normal grazed conditions, there will be a patchy pattern of use with some plants grazed completely, some moderately, and some not at all. This stubble height is compared to the minimum stubble heights criteria in the range use plans and to the recommended stubble heights tables in the guidebooks.

4. Visual obscurity (VO) measurements[2,3]

In addition to the stubble height measurements, 10 VO measurements are taken using a Robel pole along the same transect. A VO reading is taken every 20 paces.

A Robel pole is a modified surveyor's range pole, 3 cm in diameter and 120 cm in length. The pole is marked in alternating 2.54 cm (1") coloured bands. A 4-m cord is attached to the pole at a height of 1 m on one end and to a metre stick at the other end. This standardizes the distance and height at which readings are taken. One surveyor holds the Robel pole while another surveyor extends the cord and takes two readings along the transect line, following the ground contour. The reading or VO measurement is recorded as the highest band that is totally obscured. Readings are averaged at each location.

VO is a good measure of hiding cover for ground-nesting birds and small mammals. For example, sharp-tailed grouse and upland-nesting ducks such as mallards and pintails need a VO reading of 10 for adequate nesting. Smaller species require less cover.

5. Invasive plant species

List invasive plants where found, and record the size and distribution of the infestation.

6. Photos

Take representative photos at each site and record the photo numbers on the form.

2. U.S. Bureau of Land Management. 1999a. Utilization studies and residual measurements. Interagency Tech. Ref. 1734-3.

3. U.S. Bureau of Land Management. 1999b. Sampling vegetation attributes. Interagency Tech. Ref. 1734-4.

Appendix 2 Forms for extensive monitoring of stream channels, wetlands, and associated riparian areas

Forms for extensive monitoring of stream channels, wetlands, and associated riparian areas are designed for a slightly more detailed level of monitoring, but allow for estimations rather than detailed measurements.

It is important to monitor stream channels, wetland features, and adjacent riparian areas to assess whether livestock use is affecting riparian functions (stream channel dynamics, water quality, plant communities, and soils). These forms can be used as tools for extensive (rather than intensive) monitoring of riparian features and zones; for example:

- to acquire an overview of riparian health within a range tenure or larger range unit
- to identify areas with serious, but correctable, livestock management problems
- to identify areas where problems and solutions are not readily apparent and therefore require more detailed monitoring
- to detect change, early on, before serious damage occurs

Where possible, do annual inspections along with representative photos.

After several years of observations, you should be able to determine if the stream channel or wetland and associated riparian zones are on a upward, stable, or downward trend.

For streams, management changes and remedial measures may be required if you observe:

- a widening channel
- channel downcutting
- more than 10% eroding or trampled banks
- increasing frequency of new streambars, noxious weeds, or unvegetated streambanks

Wetlands in properly functioning condition.

Poorly functioning.

Non-functioning.

- a change in plant species composition (encroaching upland grass or shrub species)
- lack of shrub and tree regeneration
- hedged shrubs.

For wetlands, observe any changes:

- in the widths of emergent and riparian vegetation bands
- in plant species composition, structure, or form
- in soils (trampling, bare ground, hummocks)

Consistency is the key to obtaining useful information; the same person should collect the information at the same time each year. Monitoring should be done immediately after livestock grazing in the streamside area. If you rest the pasture, collect the information at about the same time of year as you did the previous year. If the pasture is very large or if stream characteristics vary considerably, sample by stream reach (a length of relatively homogeneous channel and vegetation). If possible, compare your findings with an ungrazed portion of the same stream or a similar riparian range reference area.

Where large segments (>10%) of a stream/wetland and associated riparian area fail to meet the *Riparian Management Area Guidebook* recommendations, permanent and more detailed monitoring transects and photo-points should be established.

The forms should be reviewed in advance of field work, and any necessary file or historic information should be gathered and recorded at that time. Generally, you should get a feel of the area by walking a stream reach or traversing an upland area before filling in the checklists or forms; this will help to gain a broader perspective that otherwise may be lost if you become too concerned with making notes. Look for relic areas or areas where livestock use has been light in order to determine site potential.

Observer _____

Date _____

STREAM AND RIPARIAN AREA MONITORING - Extensive

Stream Name _____

BCGS Map Number _____ Air Photo Number(s) _____

Sampling Site Location (stream reach) _____

Permanent Photo-points (describe locations):

(1) Channel cross-section: _____

(2) Channel and riparian area overview (take from high point): _____

Current Year Weather Conditions: Dry ☐ Normal ☐ Wet ☐

I. STREAM CHARACTERISTICS

1. Channel gradient (Circle)

   a. Low (<2%) b. Medium (2–4%) c. High (>4%)

2. Channel characteristics (Circle)

   a. Entrenched b. Non-entrenched

(See glossary)

3. Floodplain characteristics (Circle)

   a. Confined b. Non-confined

(See glossary)

4. Type of stream in a normal year (from historical records) (Circle)

   a. Perennial b. Intermittent c. Ephemeral

   (i) Continuous (ii) Interrupted

(See glossary)

5. Streambed texture (Circle)

   a. Silt b. Sand c. Gravel d. Cobble

6. Stream meander pattern (Circle)

   a. Straight b. Slightly sinuous c. Meandering d. Braided

(See glossary)

7. Estimate channel width (to the closest .5 m). Estimate between high water-marks on straight sections of stream.

   a. Narrowest ____m b. Widest _____m c. Average _____m

(Do a series of estimates to obtain an average width. Channel widening may indicate lack of adequate stabilizing vegetation, increased streamflows, and/or increased sediment.)

8. Estimate bank height on the outside of each meander, from the current water level to the top of the bank.

   _____m

   (Steep, raw banks may indicate that the channel is deepening or downcutting due to increased streamflows and/or increased sediment.)

9. Determine streambank characteristics after walking the entire stream reach.

   Estimate to the closest 10%.

   ____% of banks breaking off or eroding ____% (surface area) of stream channel shaded

10. Note number of new, unvegetated streambars per 100-m stream reach. (Circle)

    a. None b. Occasional c. Frequent

    (If frequency of streambars is increasing, streamflows and/or sediment may be increasing.)

II. VEGETATION INFORMATION

11. Estimate foliar cover in a 2-m strip outward from the streambank edge to within 10% (can sum to >100%).

    ____% Conifer or deciduous trees ____% Shrubs

    ____% Herbaceous (grasses, sedges, forbs)

    (Recent aerial photos may be helpful.)

12. Estimate amount of bare ground or rock (non-vegetated surface) exposed along a 2-m strip outward from the streambank edge (to the nearest 10%).

    ____ %

13. Estimate the average width of the riparian community (from the streambank to the beginning of the upland community).

    ____ m

    (Encroachment of upland species may indicate a dropping watertable.)

14. Are small shrub and tree seedlings present? (Circle)

    a. None b. Occasional c. Frequent

    (If no regeneration is occurring, the area is either being overgrazed or site conditions have changed for some reason.)

15. Note shape of shrubs. Is there evidence of hedging, high-lining, or umbrella-shaped shrubs? (Circle)

    a. None b. Occasional c. Frequent

    (If occasional or frequent, some overgrazing is occurring.)

III. UTILIZATION INFORMATION

16. Time of grazing this year (dates)

from _____ to _____

17. Number of AUMs harvested this year

_____ AUMs

18. Class of livestock using area

_____ Yearling _____ Cow/calf _____ Sheep ____ Other

Specify _____

_____

19. Estimate amount of wildlife use of shrubs (i.e., as a % of current year's growth). (Circle)

a. None	b. Occasional			c. Frequent		
	light	moderate	heavy	light	moderate	heavy

(It is important to distinguish between livestock and wildlife effects to design a proper grazing management system. What signs were used to determine wildlife use?)

20. Type of wildlife using area

____ Elk ____ Deer ____ Moose ____ Other

Specify _____

_____

Season(s) of use _____

(What signs were used to determine wildlife presence?)

NOTES: Mark location on an aerial photo or map. Make a sketch of the area. Describe any circumstances that may have influenced your findings.

Observer _____

Date _____

WETLAND/LAKE AND RIPARIAN AREA MONITORING - Extensive

Wetland or Wetland Complex Name _____

Sampling Site Location _____

BCGS Map Number _____ Air Photo Number(s) _____

Permanent Photo-points (describe locations):

(1) Transect: _____

(2) Wetland and riparian area overview (take from high point): _____

Current Year Weather Conditions: Dry ☐ Normal ☐ Wet ☐

I. WETLAND CHARACTERISTICS

1. Type of wetland in a normal year (Circle)

   a. Permanent b. Semi-permanent c. Ephemeral

   (See glossary.)

2. Wetland characteristics (Circle)

   a. Saline b. Fresh c. Beaver-ponded d. Closed basin

3. Estimate wetland size. _____ ha

4. Estimate width of emergent band of vegetation (reeds and cattails). _____ m

   (A sketch may be useful.)

5. Determine wetland edge characteristics after walking the entire perimeter (nearest 10%).

   _____ % of edge severely trampled _____ % of edge banks shaded by shrubs and/or trees

6. Estimate trampling of shallow wetland basin, if applicable. _____ %

II. VEGETATION INFORMATION

7. Estimate foliar cover in riparian area to within 10% (can sum to >100%).

   _____ % Conifer or deciduous trees _____ % Shrubs

   _____ % Herbaceous (grasses, sedges, forbs)

   (Recent air photos may be helpful.)

8. Estimate amount of bare ground or rock (non-vegetated surface) in riparian area (nearest 10%).

   _____ %

9. Estimate the average distance from the wetland edge to outer riparian area boundary (the beginning of the upland plant community indicated by dryland species). _____ m

(Encroachment of upland species may indicate a dropping watertable.)

10. Are small shrub and tree seedlings present? (Circle)

a. None b. Occasional c. Frequent

(If no regeneration is occurring, the area is either being overgrazed or site conditions have changed for some reason.)

11. Note shape of shrubs. Is there evidence of hedging, high-lining, or umbrella-shaped shrubs? (Circle)

a. None b. Occasional c. Frequent

(If occasional or frequent, some overgrazing is occurring.)

III. UTILIZATION INFORMATION

12. Time of grazing this year (dates)

from _____ to _____

13. Number of AUMs harvested this year _____ AUMs

14. Class of livestock using area

_____ Yearling _____ Cow/calf _____ Sheep _____ Other

Specify _____

_____

15. Estimate amount of wildlife use (i.e., as % of current year's browse).

a. None	b. Occasional			c. Frequent		
	light	moderate	heavy	light	moderate	heavy

(It is important to distinguish between livestock and wildlife effects to design a proper grazing management system. What signs were used to determine wildlife use?)

16. Type of wildlife using area

_____ Elk _____ Deer _____ Moose _____ Other

Specify _____

_____

Season(s) of use _____

(What signs were used to determine wildlife presence?)

NOTES: Mark location on an aerial photo or map. Make a sketch of the area. Describe any circumstances that may have influenced your findings.

Appendix 3 Examples of how to complete function checklists and extensive monitoring forms

Lakes, Ponds, and Wetlands Riparian Function Checklist

Range Unit: Stamp Lake CRMP Unit	Range Agreement Holder: Joe Rancher
	Range Agreement Number: RAN1234
UTM Coordinates:	BEC Subzone: IDFdk1
Name of Riparian-Wetland Area: Smith Lake (East)	
Date: Aug 17/1996 Segment ID:	
Classification of Lake or Pond:	
Type of Wetland (<2 m depth):	Marsh ☐ (beaver-ponded; fresh water; saline; closed basin)
	Swamp ☐ Bog ☐ Fen ☐ Shrub-carr ☒
Observers:	

Yes	No	N/A	Parameters
			Hydrologic
X			Water levels have remained unchanged over time (willow fringe or willow skeletons)
			Biotic/Vegetation
X			The plant community is showing good vigour and maintenance of riparian soil moisture characteristics
X			Diversity and structure of the riparian and emergent vegetation has been maintained
X			The plant community is adequate to filter sediments and pollutants
X			Occurrences of trampling, rubbing, or browsing are uncommon
X			Adequate vegetation cover is present to protect banks
X			A diversity of vertebrate and invertebrate life is evident
X			The riparian plant community is an adequate source of large woody debris, both now and for the foreseeable future
			Erosion/Deposition
X			Bank shearing, soil compaction, and bare ground are uncommon
		X	Soil erosion and deposition in the wetland and riparian area are within natural levels
X			Hummocks are rounded and completely vegetated
			Nutrient Inputs and Water Quality
X			Nutrient levels are normal (there is a lack of algal mats and organism die-offs and there is a good aquatic species diversity)
X			Inputs of fine organic matter are appropriate (leaves, small branches, and twigs)

Check one	
PFC	☑
At risk	☐
Non-functional	☐

Notes:

Is the desired plant community present (diversity—species, composition, age classes, structure, form)?

Soil types and textures?

Are the riparian soils subjected to prolonged saturation and anaerobic conditions?

Is this wetland part of a beaver-controlled riparian system?

Streams Riparian Function Checklist

Range Unit: Stump Lake			Range Agreement Holder: JAC Ranches Range Agreement Number: RAN 1234
UTM Coordinates:			BEC Subzone: IDF dk1
Name of Stream: Stumplake Creek			
Date: Aug 6/96 Segment/Reach ID: above road			Gradient of Segment: Low ☒ Medium ☐ High ☐
Stream Type: Perennial ☐ Intermittent or Ephemeral ☐ Continuous or Interrupted ☐			
Observers: Hana & Yvonne Zuevgarde and Tongen Stringham			
Yes	**No**	**N/A**	**Parameters**
			Channel Structure, Function, and Diversity
X			Channel characteristics (rocks, large woody debris) and associated floodplain (access to overflow areas) are adequate to dissipate energy
X			Channel and banks are relatively stable
X			Lateral movement is associated with natural sinuosity
X			The segment is vertically stable
X			Erosion, deposition, and movement of bed materials are normal for this reach
X			Bank shearing, soil compaction, and bare ground are uncommon
X			Sinuosity, width/depth ratio, gradient, pool/riffle ratio, and other aspects of channel geometry are in balance with the landscape setting (e.g., landform, geology)
X			Inputs of organic debris from adjacent riparian area and subsequent incorporation into the channel are normal for area
X			Banks are undercut
	X		Riffle-bed materials and gravels are free of sediment. Fish spawning and use of rock undersides by insects and other invertebrates are possible
			Flow Regime
	X		Flow rates and timing remain unchanged over time (i.e., perennial to intermittent or ephemeral; continuous to interrupted)
			Biotic Community
X			Roots of trees, shrubs, and grasses extend into the stream. Root masses are capable of withstanding high streamflow events and allowing formation of overhanging banks
X			The plant community exhibits high vigour and indicates maintenance of riparian soil moisture characteristics
X			Occurrences of trampling, rubbing, or browsing are uncommon
X			Riparian plant communities are an adequate source of replacement woody debris, both now and in the foreseeable future
X			A diversity of vertebrate and invertebrate life is evident
			Nutrient Inputs and Water Quality
X			Nutrient levels are normal (there is a lack of algal mats and organism die-offs, and there is a good aquatic organism diversity)
X			Inputs of fine organic matter are appropriate (leaves, small branches, and twigs)

Check one	
PFC	☑
At risk	☐
Non-functional	☐

Notes:

Is the desired plant community present (diversity—species, composition, age classes, structure, form)?

Does the substrate make this stream susceptible to either vertical or lateral erosion?

Soil types and textures?

Are the riparian soils subjected to prolonged saturation and anaerobic conditions?

Is the stream beaver-controlled?

Is the stream effluent or influent?

Have land uses altered the dynamics of the system?

Uplands Function Checklist

Range Unit: Stumplake CRMP Unit			Range Agreement Holder: Joe Rancher Range Agreement Number: RAN 1234
UTM Coordinates:			BEC Subzone: IDPdk1
Name of Upland Area: Stumplake Creek			
Date: August 17, 1996			Location: above road
Hectares:			
Observers: Lance and Lavanne Zweygardt and Tamzen Stringham			
Yes	**No**	**N/A**	**Parameters**
			Hydrologic and Soils
X			Organic material (plant litter, standing vegetation) protects soil surface from raindrop impact and evaporative effects of sun and wind
X			Water will easily infiltrate the soil surface (absence of physical soil crusting, capping)
X			Subsurface soil conditions support infiltration (compaction layers are uncommon)
X			Standing vegetation and plant litter detain overland water flow and trap sediment
		X	Non-stream ephemeral drainages are stable (sufficient vegetation is present to protect against downcutting)
			Biotic/Vegetation
X			The plant community is showing good vigour
X			There is recruitment of desirable plant species (new seedlings)
X			The plant community reflects a fully occupied root zone
		X	Seeps, springs, and ephemeral drainages support vigorous stands of phreatophytic plants
X			Biological breakdown of plant residues / organic material is apparent (decomposition as opposed to oxidization)
X			Biological breakdown of livestock dung is rapid
X			A diversity of vertebrate and invertebrate life is evident
			Erosion/Deposition
X			Evidence of rills, gullies, pedestalling, and other excessive soil movement is uncommon
			There is little visual evidence of pedestalling of plants or rocks. Pedestals present are sloping or rounding and accumulating litter

Check one	
PFC	☑
At risk	☐
Non-functional	☐

Notes:
Is the desired plant community present (diversity—species, composition, age classes, structure, form)?

Soil types and textures?

Observer Lance Giovanna Zwaggardo and Taegan Stringham

Date August 17/96

WETLAND/LAKE AND RIPARIAN AREA MONITORING - Extensive

Wetland or Wetland Complex Name Smith Lake

Sampling Site Location East side of hyas line

BCGS Map Number _____ Air Photo Number(s) _____

Permanent Photo-points (describe locations):

(1) Transect: _____

(2) Wetland and riparian area overview (take from high point): _____

Current Year Weather Conditions Dry ☐ Normal ☐ Wet ☒

I. WETLAND CHARACTERISTICS

1. Type of wetland in a normal year (Circle)

   a. Permanent b. Semi-permanent (c.) Ephemeral

   (See glossary.)

2. Wetland characteristics (Circle)

   a. Saline (b.) Fresh c. Beaver-ponded d. Closed basin

3. Estimate wetland size.

   _____ ha

4. Estimate width of emergent band of vegetation (reeds and cattails).

   _____ m Solid

   (A sketch may be useful.)

5. Determine wetland edge characteristics after walking the entire perimeter (nearest 10%).

   10 % of edge severely trampled 80 % of edge banks shaded by shrubs and/or trees

6. Estimate trampling of shallow wetland basin, if applicable.

   5 %

II. VEGETATION INFORMATION

7. Estimate foliar cover in riparian area to within 10% (can sum to >100%).

   20 % Conifer or deciduous trees 40 % Shrubs 45 % Herbaceous (grasses, sedges, forbs)

   (Recent air photos may be helpful.)

8. Estimate amount of bare ground or rock (non-vegetated surface) in riparian area (nearest 10%).

   10 %

9. Estimate the average distance from the wetland edge to outer riparian area boundary (the beginning of the upland plant community indicated by dryland species).

   5 m

   (Encroachment of upland species may indicate a dropping watertable.)

10. Are small shrub and tree seedlings present? (Circle)

    a. None (b.) Occasional c. Frequent

    (If no regeneration is occurring, the area is either being overgrazed or site conditions have changed for some reason.)

11. Note shape of shrubs. Is there evidence of hedging, high-lining, or umbrella-shaped shrubs? (Circle)

    a. None (b.) Occasional c. Frequent

    (If occasional or frequent, some overgrazing is occurring.)

III. UTILIZATION INFORMATION

12. Time of grazing this year (dates)

    from June 1 to June 20
    Sept 20 Oct 22

13. Number of AUMs harvested this year

    _____ AUMs

14. Class of livestock using area

    _____ Yearling X Cow/calf _____ Sheep _____ Other
    Specify _____

15. Estimate amount of wildlife use (i.e., as % of current year's browse).

a. None	(b.) Occasional			c. Frequent		
	light	(moderate)	heavy	light	moderate	heavy

(It is important to distinguish between livestock and wildlife effects to design a proper grazing management system. What signs were used to determine wildlife use?)

16. Type of wildlife using area

_____ Elk X Deer droppings X Moose some highlining _____ Other Specify _____

Season(s) of use Continuous

(What signs were used to determine wildlife presence?)

NOTES: Mark location on an aerial photo or map. Make a sketch of the area. Describe any circumstances that may have influenced your findings.

Observer Lance & Lavanne Zweggardt and Tamzen Stringham

Date August 17, 1996

STREAM AND RIPARIAN AREA MONITORING - Extensive

Stream Name Stringplake Creek

BCGS Map Number _____ Air Photo Number(s) _____

Sampling Site Location (stream reach)_____

Permanent Photo-points (describe locations):

(1) Channel cross-section: _____

(2) Channel and riparian area overview (take from high point): _____

Current Year Weather Conditions ☐ Dry ☐ Normal ☐ Wet ☒

I. STREAM CHARACTERISTICS

1. Channel gradient (Circle)

(a.) Low (<2%) b. Medium (2– 4%) c. High (>4%)

2 Channel characteristics (Circle)

a. Entrenched (b.) Non-entrenched

(See glossary.)

3. Floodplain characteristics (Circle)

a. Confined (b.) Non-confined

(See glossary.)

4. Type of stream in a normal year (from historical records) (Circle)

(a.) Perennial b. Intermittent c. Ephemeral

(i) Continuous (ii) Interrupted

(See glossary.)

5. Streambed texture (Circle)

a. Silt b. Sand c. Gravel d. Cobble

6. Stream meander pattern (Circle)

a. Straight (b.) Slightly sinuous c. Meandering d. Braided

(See glossary.) more than one channel

7. Estimate channel width (to the closest .5 m). Estimate between high water-marks on straight sections of stream.

   a. Narrowest 2 m b. Widest 4 m c. Average 3 m

   (Do a series of estimates to obtain an average width. Channel widening may indicate lack of adequate stabilizing vegetation, increased streamflows, and/or increased sediment.)

8. Estimate bank height on the outside of each meander, from the current water level to the top of the bank.

   <1.5 m

   (Steep, raw banks may indicate that the channel is deepening or downcutting due to increased streamflows and/or increased sediment.)

9. Determine streambank characteristics after walking the entire stream reach. Estimate to the closest 10%.

   <10 % of banks breaking off or eroding _____% (surface area) of stream channel shaded

10. Note number of new, unvegetated streambars per 100-m stream reach. (Circle)

    (a.) None b. Occasional c. Frequent

    (If frequency of streambars is increasing, streamflows and/or sediment may be increasing.)

II. VEGETATION INFORMATION

11. Estimate foliar cover in a 2-m strip outward from the streambank edge to within 10% (can sum to >100%).

    _____% Conifer or deciduous trees _____% Shrubs _____% Herbaceous (grasses, sedges, forbs)

    Creek was not accessible ∴ no estimate was made

    (Recent aerial photos may be helpful).

12. Estimate amount of bare ground or rock (non-vegetated surface) exposed along a 2-m strip outward from the streambank edge (to the nearest 10%).

    <10 %

13. Estimate the average width of the riparian community (from the streambank to the beginning of the upland community).

    <75 m = average width of stream influence

    (Encroachment of upland species may indicate a dropping water table.)

14. Are small shrub and tree seedlings present? (Circle)

    a. None (b.) Occasional c. Frequent

    (If no regeneration is occurring, the area is either being overgrazed or site conditions have changed for some reason.)

15. Note shape of shrubs. Is there evidence of hedging, high-lining, or umbrella-shaped shrubs? (Circle)

    a. None (b.) Occasional c. Frequent

    (If occasional or frequent, some overgrazing is occurring.)

III. UTILIZATION INFORMATION

16. Time of grazing this year (dates)

from June 21 to Sept 10

17. Number of AUMs harvested this year

_____ AUMs

18. Class of livestock using area

_____ Yearling X Cow/calf _____ Sheep _____ Other Specify _____

19. Estimate amount of wildlife use of shrubs (i.e., as a % of current year's growth). (Circle)

a. None	b. Occasional			c. Frequent		
	(light)	moderate	heavy	light	moderate	heavy

(It is important to distinguish between livestock and wildlife effects to design a proper grazing management system. What signs were used to determine wildlife use?)

20. Type of wildlife using area

_____ Elk _____ Deer X Moose _____ Other Specify _____

Season(s) of use Summer and Fall

(What signs were used to determine wildlife presence?)

NOTES Mark location on an aerial photo or map. Make a sketch of the area. Describe any circumstances that may have influenced your findings.

Appendix 4 A glossary of terminology

Plant communities:

Current plant community – The plant community currently occupying a site. It is usually described by strata, structure, and species composition.

Desired plant community – The plant community that produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the objectives set in range use plans and higher-level plans. It must be consistent with site potential.

Potential natural community – The plant community that would establish if all successional sequences were completed without interferences by humans under current environmental conditions. Natural disturbances are inherent in its development, and acclimatized non-native species may be included.

Riparian area – An area of land adjacent to a stream, river, lake, or wetland containing vegetation that, due to the influence of water, is distinctly different from the vegetation of adjacent upland areas.

Occurrence – There are no hard and fast rules for describing occurrences of individuals or events; however, they can be listed in order of ascendancy as follows:

Uncommon < *Occasional* < *Common* < *Frequent*

Usage of browse species – Use the following general guidelines:

Light – <10% utilization of annual growth. This is incidental use.

Moderate – 10–40% utilization of annual growth.

Heavy – >40% utilization of annual growth. Prolonged heavy use will lead to a change in shrub growth-form

Stream channel characteristics:

Entrenched – A stream is entrenched when vertically eroded to the point where it no longer has access to its floodplain during a normal flood event. An entrenched stream will have to develop a new floodplain at a lower level.

Non-entrenched – Stream is able to reach its floodplain during a normal flood event.

Floodplain characteristics:

Confined – Floodplain is unable to broaden because of natural topographic features or human-caused changes.

Non-confined – Floodplain is able to broaden without undue restrictions from topography or human-caused changes.

Stream meander patterns:

Straight – Having a stream length to valley length ratio of 1.0.

Sinuous – Having a stream length to valley length ratio of 1.05 to about 1.5.

Meandering – Having a stream length to valley length ratio of 1.5 or greater.

Braided – Having multiple and interconnected channels.

Stream flows:

Perennial – A stream that flows year around.

Intermittent – A stream that flows only at certain times of the year when it receives water from springs or from some surface sources such as melting snow or a heavy rainfall.

Ephemeral – A stream that flows only in direct response to precipitation, and whose channel is above the watertable.

Continuous – A stream having a surface flow that can be observed along the entire channel.

Interrupted – A stream having a flow that alternates as surface and groundwater flow as it moves down channel.

Wetlands – A wetland is an area of land that is covered by water for part or all of the year. It may be associated with a lake, stream, or coastal habitat. Wetlands may be fresh, saline, or acidic, and range in permanency.

Wetland characteristics:

Permanent – Remain flooded all year during normal moisture conditions. Might dry up during periods of prolonged drought.

Semi-permanent – Generally dry up at some time during a year with normal moisture conditions.

Ephemeral – Flooded for less than 6 weeks in an average year and are recharged by snowmelt or seasonal cloudbursts.

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